Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of the Commission's Rules to Promote Aviation Safety	)	WT Docket No. 19-140
	)	

COMMENTS OF MOOG, INC. ON NOTICE OF PROPOSED RULEMAKING

Moog Inc. ("Moog"), by its attorney, hereby submits its comments on the Commission's Notice of Proposed Rulemaking ("NPRM") in the above-referenced docket.[1] In particular, Moog's comments focus on the consideration of rules to enable the deployment of Enhanced Flight Vision Systems ("EFVS") in the United States in the 92.0-95.5 GHz range (the "94 GHz Band").

Moog applauds the Commission for initiating a proceeding that considers multiple ways to use spectrum in new ways to improve the efficiency and safety of aviation. As discussed herein, Moog believes that the proposed EFVS systems, as championed by Sierra Nevada Corporation ("SNC"), can operate on a compatible basis with Foreign Object Debris ("FOD") systems at the same location through frequency separation without causing each other interference or compromising system performance. On that basis, Moog does not object at this time to the EFVS proposal in the NPRM, but it will continue to monitor the docket for further developments and any possible concerns raised in the record.

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[1] *In the Matter of Amendment of the Commission's Rules to Promote Aviation Safety,* Notice of Proposed Rulemaking, FCC 19-53, WT Docket No. 19-140 (rel. June 7, 2019) ("NPRM").

INTRODUCTION

Moog, headquartered in East Aurora, NY, is a worldwide designer, manufacturer, and integrator of precision control components and systems. Moog offers a variety of airport and airfield solutions, including airport runway surveillance, distance measuring equipment, direction finding, and tactical air navigations. Of relevance to the EFVS proposal in the NPRM, Moog offers the Tarsier Automatic Runway FOD Detection System ("Tarsier"), the world's first automatic runway FOD detection and warning system. Tarsier uses millimeter wave radars centered at 94.32 GHz with a sweep of +/- 720 megahertz, *i.e.*, use of the range 93.60-95.04 GHz, to continuously scan runway surfaces and pinpoint debris location with precise range and bearing in a wide range of conditions in low light conditions especially in complete darkness and degraded weather including snow, sandstorms, and dense fog.[2] FOD, if undetected and unaddressed, can potentially be debilitating to jet engines and otherwise dangerous to aviation operations, endangering passengers and crew as well as equipment. As noted below, Moog is starting to deploy Tarsier systems in the United States. As such, Moog has an interest in the Commission's proposal to allow for EFVS operation in the 94 GHz Band in this country. As explained below, Moog has no objection to EFVS at 94 GHz *per se*, but it is very interested in assuring that the operation of EFVS would be compatible with Tarsier without undue constraints.

Tarsier was first inaugurated at Vancouver, Canada's airport in 2006. The Federal Aviation Administration ("FAA") has reviewed the Tarsier system which, in part, has formed the basis for the FAA's development of FOD-related standards for systems operating in the 92-100 GHz bands. Most recently, Tarsier is now being deployed in the United States at the Marine

[2] The Tarsier system can detect debris, such as a bolt, that is only a couple centimeters in length.

Corps Air Station in Yuma, Arizona, and Moog anticipates commencement of operation in the second half of this year. Additional military locations are under consideration. Moog is also evaluating the introduction of Tarsier FOD systems at non-Federal government airports.

DISCUSSION

Moog is desirous of finding solutions with proposed co- and adjacent-band systems to enable compatible operation wherever feasible. While Moog expects that its FOD system can be compatible with many other types of 94 GHz operations, in part because of the limited locations where Tarsier will be deployed (*i.e.*, at airfields) and because of the use of down-tilted antennas, *i.e.*, oriented toward the surface of the runways, confirming compatibility requires sufficient information about other systems. To that end, Moog is pleased that the Commission, in the NPRM, sought comment "specifically on whether Enhanced Flight Vision System radars are compatible with existing and contemplated services in the 92-95.5 GHz band, such as foreign object debris detection systems."[3] To facilitate potential EFVS systems, the NPRM also proposes to amend the Table of Allocations to add a Radionavigation Service allocation to the 94 GHz Band and amend part 87 by adding service rules listing the 94 GHz Band as an authorized band for EFVS radar.[4] The Commission asks commenters to identify any other rule changes necessary to allow for the operation of EFVS and to address any effects that EFVS, under any new rules, may have on other services.[5]

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[3] NPRM, ¶ 12. The Commission noted that the International Telecommunication Union Radiocommunication Sector Working Party 5B is actively considering a proposal to authorize FOD detection systems in the 92-100 GHz band. *See* ITU Radiocommunication Study Groups, Working Party 5B (DG 5B - 1a – Radars 92-100 GHz), *Technical and operational characteristics of the foreign object debris detection system operating in the frequency band 92-100 GHz* (7 May 2019); *id.*, n.26.

[4] NPRM, ¶ 13.

[5] *Id.*

Following issuance of the NPRM, representatives from Moog and SNC convened a discussion regarding the prospects for compatible operations of their EFVS and FOD solutions in the 94 GHz Band at the same airport. In this initial discussion, the companies discussed the operational characteristics and spectrum needs of each system during degraded conditions, which Moog understands is the only period during which EFVS would operate.[6] The initial assessment was reached that simultaneous operation of the two companies' systems is readily achievable by way of the EFVS system selecting channels – each 100 megahertz in bandwidth, with only a handful needed at any one time at one airfield location – diverse from the frequency range utilized by the FOD system. Indeed, Moog's understanding is that the Tarsier and SNC EFVS systems, together, would utilize no more than about 60% of the spectrum in the 92.0-95.5 GHz range. Consequently, the spectrum needs of the two systems can be accommodated without any overlap within the intended frequencies of their operation.[7] In practice, coexistence at some locations will need to consider other geographically proximate users of the bands, if any, which might in some situations, at least theoretically, impact the flexibility of EFVS to select frequencies distinct from a FOD system at the airport where 94 GHz EFVS is deployed.

CONCLUSION

At this juncture, for the reasons given above, Moog is encouraged that an EFVS, as described by SNC, the only company to show interest in EFVS systems during the petition for

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[6] *Amendment of the Commission's Rules to Allow for Enhanced Flight Vision System Radar under Part 87*, Petition of Sierra Nevada Corporation for Rulemaking, Docket No. RM-11799, at 7-9 (filed Feb. 16, 2018) (EFVS would be used as a low altitude short-range system, *e.g.*, during the last 8,000 feet during an approach to landing).

[7] A Tarsier FOD system, as described earlier, would use a total bandwidth of 1.44 gigahertz centered at 94.32 GHz, permitting EFVS access to more than 1.5 gigahertz below and several hundred megahertz above the FOD system, in instances where the two types of system are operated at the same location.

rulemaking stage, and a Tarsier FOD system ostensibly should be able to operate at the same location. Based on the foregoing understanding, Moog has no objections to rules that would permit operation of EFVS in the 94 GHz Band, assuming the operation is comparable to that of the SNC-proposed system. Moog looks forward to reviewing the other comments filed in response to the NPRM and, as appropriate, will offer further reply and observations on these matters.

Respectfully submitted,

MOOG, INC.

Paul Revell
Managing Director
MOOG FERNAU LTD.
Airport Executive Park
Luton
Beds LU2 9NY
United Kingdom

Edward A. Yorkgitis, Jr.
KELLEY DRYE & WARREN, LLP
3050 K Street, NW
Suite 400
Washington, DC 20007
(202) 342-8420

Its Counsel

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